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FINAL TECHNICAL REPORT -- IUE GRANT NASA / NAG-5-1447

"UV Spectroscopy of Four Critical LBV's in Carina"
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Observations for this project were made in several IUE shifts in July 1991 and May 1992. Three very unusual, very massive stars were observed: Eta Carinae, HR Carinae, and He3-519. The resulting spectral data are of good quality.

The last of these, He3-519, had not been observed with IUE before, and indeed had not been studied much at all. Our IUE data, supported by ground-based data, showed that this star is one of the most luminous known and is quite distant and subject to considerable interstellar extinction. (The IUE observations were originally intended mainly to determine the amount of interstellar extinction, which helps to imply the distance.) Something unexpected turned up in the IUE data: the spectrum has a conspicuous emission line at a wavelength of 3008 A, virtually unique among all known stellar spectra. This feature is probably due to FeIII and probably indicates that the stellar wind is processing the radiation in a peculiar way, but the theoretical explanation is not well developed yet. In general, we have concluded that He3-519 is practically the hottest of the "WN/Of"-type stars, has most likely progressed beyond its chaotic LBV ("Luminous Blue Variable") stage of evolution, and will soon develop into an extremely luminous WN-type star. No other star is known to be at quite the same evolutionary stage as He3-519.

The results outlined above will be published in the Astrophysical Journal in 1993: "He3-519: A Peculiar Post-LBV, Pre-WN Star?", by K. Davidson, R.M. Humphreys, A. Hajian, and Y. Terzian. [One reason why this report has been delayed is that we were waiting to be sure that this paper will indeed appear in the Astrophysical Journal. The referee report arrived only recently.]

Our new IUE data on the famous eruptive LBV Eta Carinae are being used in comparison with data obtained with the HST (the Space Telescope). Our spectroscopy with the HST covers a tiny region around the central star, while the IUE covers a larger region whose diffuse material is important. Since Eta Carinae fluctuates, it was important to obtain new, recent IUE data. As stated in our original IUE proposal, it was also desirable to have recent data on Eta Carinae added to the IUE archives, to supplement the mid-1980's data to show whether changes occured in the intervening years. The HST results are still being analyzed and a paper incorporating the HST and IUE data together will be submitted for publication in 1993.

Our new IUE data on the third star, HR Carinae, were intended mainly for archival purposes. Since the spectrum showed no major change since the earlier IUE data, we do not presently plan any publications based on these data. The observations were successful, though, and will be useful to any future investigators of HR Carinae.